

# Reducing the Threat of Southern Pine Beetle Infestations:

## A Guide to Cost Share Pine Thinning Operations in Mississippi



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## **Introduction**

The southern pine beetle (*Dendroctonus frontalis* Zimmermann, SPB) has been damaging pine forests in Mississippi for hundreds, if not thousands of years. Many landowners have suffered losses and have even lost entire stands. Such wide spread damage has grasped the public's attention in a manner unlike any other forestry issue. Proactive management activities such as periodic thinnings can increase overall forest health and reduce the threat of a SPB outbreak.

This guide helps explain why the SPB is a major threat to Mississippi's pine forests and how thinning pine stands can reduce the threat of the SPB. In addition, these guidelines explain how to apply for federally sponsored cost shares available for thinning moderate to high hazard stands.

## **SPB Biology**

Pine trees are killed by adult beetles, which are black or dark brown and approximately 1/8" long, who attack in large numbers to overcome the natural defenses of the tree. A pair of beetles (male and female) enters the tree by boring through the bark. The female eats her way through the inner bark and lays small white eggs on the side of the gallery or tunnel as she constructs it. The male follows her in the gallery and moves and packs the frays (debris and dust) left by the female behind him. Winding sinuate galleries, which may cross each other, are created by the females in the infested portion of the bark. The infested portion of the bole is usually from the ground to the first live limb; however, this can vary greatly between individual infestations.

After gallery construction is complete, the adults bore out through the bark to attack at another location on the tree or fly to another tree. The tree is killed by a combination of factors which result from gallery construction and the introduction of blue staining fungi into the tree.

Eggs hatch and the larvae bore through the inner bark away from the adult's gallery. The white grub looking larvae grow approximately 1/8" long as they move. When mature, the larvae bore into the outer bark and begin to develop into the pupae or resting stage. The pupae are very soft and white with visible eye patches and premature wings.

After pupation, the newly formed adults bore their way out of the bark. These adults fly to adjacent unattacked trees in the vicinity, or they may fly some distance away to create a new infestation. The distance which an adult can fly depends on its health and weather conditions at the time. In ideal conditions, the beetles can travel a long distance.

Beetles overwinter in all stages of development. Anytime the temperature increases above 55°F, they continue to develop or move to new trees to continue the infestation. There can be as many as seven generations a year depending on the climatic conditions.

SPB populations tend to go through cycles. Periods between epidemics (large beetle populations) vary in length from three to fifteen years with the epidemics lasting three to five years. It has not been determined why the population fluctuates in this manner nor is it possible to accurately determine when the numbers will go up or down.

## Recognizing SPB Infestations

Fading trees are usually the first thing noticed about a SPB spot. As the trees die, their needles turn yellow and then red before they fall off. Aerial surveillance is conducted by the Mississippi Forestry Commission (MFC) on private lands and by other organizations (U.S. Forest Service, wildlife management units, forest industry, or other large private or public land holders) on land for which they are responsible. Information on possible infestations on private land can be obtained from the MFC by contacting the County Forester in the county where the property is located or by contacting foresters with other organizations if the private land is adjacent to their property.

Since not all fading trees are killed by SPB, it is important to know other symptoms. Pitch tubes are another good indicator. Pitch tubes are formed when the beetles enter a tree. They are dirty white balls of resin resembling popcorn approximately ¼” to ½” diameter.

The best way of identifying the SPB is the gallery patterns which can be seen under the bark. They have a winding sinuate pattern with many adult gallery intersections. The larval galleries will tend to be on alternate sides of the gallery. Other bark beetles tend to have straight, “H”, or “Y” shaped galleries, and the larval galleries are concentrated on one side of the adult gallery.

## Which Pines Are Most Susceptible?

The SPB prefers to attack loblolly (*Pinus taeda*) and short leaf (*P. echinata*) pines that are older than 10 years of age. Those growing in unmanaged forests are especially susceptible. Longleaf (*P. palustris*) and slash (*P. elliottii*) pines are much less susceptible.

## How to Recognize a SPB-Prone Pine Stand

SPB Hazard Rating is a system for ranking stands in susceptibility classes based on site and stand characteristics. A numerical hazard score is obtained from an equation that relates site and stand characteristics for the potential for SPB infestations. Hazard rating should not be confused with risk rating, which predicts timber losses resulting from spot growth once a spot has formed. With a hazard rating, we are more concerned with preventing beetle infestations and timber loss by applying timely cultural practices.

## Two Hazard Rating Systems for Mississippi

Two hazard rating equations are listed below. Both systems were developed at Mississippi State University from existing regional models.

The first hazard rating system uses only pine basal area and radial growth in the last 10 years. The hazard score is calculated from this equation:

$$\text{Equation 1: Score} = 2.004 (\text{Pine BA}) - 46.4058 (\text{Radial Growth}) + 6.92$$

The second and more complicated system uses pine basal area, total basal area (basal area of pine and hardwood), average pine age, site index, and total number of trees per acre. The score is calculated from this equation:

$$\text{Equation 2: Score} = 1.8342 (\text{Pine BA}) + 0.7050 (\text{Age}) + 0.0020 (\text{Trees/Acre}) + 0.8800 (\text{Site Index}) + 0.4085 (\text{Total BA}) - 206.3150$$

Once you have calculated the hazard scores for each timber stand, you can use the actual scores to rank your timber stands, or you can use the scores to determine the relative ranks from a chart of potential susceptibility classes. The potential susceptibility classes and relative ranks for our two hazard systems are shown here:

Table 1

| Equation 1<br>Scores | Equation 2<br>Scores | Potential<br>Susceptibility | Rank |
|----------------------|----------------------|-----------------------------|------|
| 233+                 | 220+                 | Very High                   | 1    |
| 185-222              | 168-219              | High                        | 2    |
| 109-184              | 62-167               | Medium                      | 3    |
| 72-108               | 11-61                | Low                         | 4    |
| <71                  | <10                  | Very Low                    | 5    |

As you can see, the range of scores for the two hazard systems is not the same for the same potential susceptibility class. The numeric value of a hazard score has no quantitative interpretation; the scores are only used to obtain relative rankings for potentially susceptible pine stands during periods of high beetle population.

These scores are best used when interpreted as priorities for implementing planned cultural practices, such as thinning.

Hazard rating should not be the sole basis of forest management activities. Rather, it should provide additional management information to help you make decisions about the implementation of planned practices. The scores from these two hazard systems should not be compared with each other. Two hazard systems are presented solely for the purpose of demonstrating a "simple" and a "complicated" system. They were obtained from preliminary research results at Mississippi State University, and may not be applicable to your timber stands. You can receive help in hazard rating your stands from a consulting forester, MSU extension forester, or MFC service forester.

### **How to Prevent SPB Infestations**

Maintaining a healthy vigorous pine stand is the best defense against the SPB. Dense, slow growing or damaged trees are much more susceptible. Dense stands should be thinned to increase the growth rate of selected crop trees. Over-mature stands should be harvested and the land should be replanted. Harvest operations should be conducted in a manner which will protect the soil and the remaining trees.

Tree vigor or overall health is indicated by radial growth. Trees which are not healthy grow slower than trees in good health. Diseased, damaged, or crowded trees will not grow well and SPB's are attracted to these trees. This can become a focal point for a new infestation. Removing, or at least felling these kinds of trees can lower the susceptibility of the entire stands and capture potential mortality that would otherwise be lost.

Lowering the competition between trees is the best way to lower the losses to the SPB. By removing the slowest growing trees from a stand, crop trees can be favored. These remaining crop trees are released from competition, which reduces the risk of attack, but more importantly, the growth potential of the stand is placed on the remaining stems. Concentrating growth on the lower number of crop trees greatly increases the economic returns to the landowner because they can be cut for sawtimber much earlier.

As timber gets older, the growth of the individual trees slows down. Stands which are biologically over-mature can become very vulnerable to attack. However, with proper thinning, adequate health or vigor can be maintained as the stand gets older. Age as it relates to the susceptibility to the SPB should not become a factor if management decisions are based on economic returns. If older trees are being grown for aesthetics or other reasons, it is very important to watch them closely during SPB epidemics and to remove infested trees as soon as possible.

If a SPB outbreak does occur in a thinned stand, it is less likely to spread beyond a few trees, due to the wider tree spacing, adverse conditions for beetle flight, and other factors. Additional recommendations for SPB prevention include:

1. Remove lightning struck, diseased, and suppressed trees during thinning operations.
2. Avoid prescribed burning in young (<10 year old) stands.
3. Plant a species that is adapted to the site.

### **When to thin?**

Many factors determine when a pine plantation is ready to be thinned. This includes stand density, site productivity, planting density, overall competition, and susceptibility to the southern pine beetle. Thinning your stand at the proper time will not only help reduce the threat of the SPB, but also set the stage for higher valued products (chip-n-saw and sawtimber) from your stand. For more information, contact a consulting forester, extension forester, or MFC Service Forester. Publications on pine thinning can also be found at:

<http://msucares.com>

### **How to thin?**

Site quality, species, age, tree density, size and vigor are all taken into consideration when thinning a stand. Often times, more trees are left on higher quality sites than on poorer sites. The location of the stand, current timber markets, and the type of logging equipment to be used influences the thinning prescription. A list of professional logging contractors in the local area can be obtained at <http://logged.msstate.edu/>.

Typically, first plantation thinnings are conducted using “row thinning”. Row thinning is used is to facilitate the equipment working in the stand. A row thin is done by removing an entire row through the plantation. Removing every 5<sup>th</sup>, 4<sup>th</sup>, or 3<sup>rd</sup> rows are common practices in first commercial thins. Trees in the remaining rows are then selectively harvested by the operator (see operator select thinning below).

Strip thinning is used in natural stands, or in plantations where distinct rows are not present. This is used in stands that have naturally seeded in following planting. In strip thinning, all trees in a strip of a certain width are removed. The cut strip should be at least 15 feet wide to allow the machinery access to the stand. The width of the uncut strips can be determined by the desired number of residual trees per acre or based on landowner objectives.

Some stands are thinned using the leave tree method. In this method, the trees to be left behind are marked, with the operator removing the non-marked trees. This is much more common with second and later thins.

An operator select thinning can also be conducted. In this method, the operator of the harvesting equipment decides which trees to remove and which to leave. Experienced operators will thin the stand to a prescribed basal area or number of trees per acre. This is the common method for pre-commercial thinning.

Regardless of the thinning operation undertaken, it is recommended that a consulting forester supervise all activities to ensure that management goals are realized. A list of consulting registered foresters operating in the local area may be obtained from <http://www.cfr.msstate.edu/borff/>.

### **Cost Share Programs Available for SPB prevention**

The Mississippi Forestry Commission in conjunction with the USDA Forest Service and Mississippi State University Extension Forestry are conducting a cost share program to encourage private forest landowners to thin their dense pine stand and prevent future SPB infestations. These cost shares serve as an incentive to conduct thinning operation prior to the next SPB outbreak, regardless of market conditions for pulpwood.

Federal cost share funds for SPB prevention are provided by the USDA Forest Service, Forest Health Protection and administered by the Mississippi Forestry Commission. Mississippi State University Extension Forestry is also a collaborator on this project. The availability of cost shares in future years is contingent upon continued funding of the SPB prevention project by the USDA Forest Service.

### **Landowner Cost Shares for Precommercial Thinning**

To qualify for federal cost shares, a stand to be pre-commercially thinned must be:

1. 4-12 years of age,
2. Minimum of 10 and maximum of 5,000 contiguous acres
3. Have a stand density greater than 700 stems per acre
4. Privately owned forestland located in Mississippi
5. Be rated as moderate to very high hazard for southern pine beetle outbreak
6. comprised of at least 70% loblolly, shortleaf, or slash pine

### **Cost shares for pre-commercial thinning are a flat \$75 per acre.**

Receipts for actual costs incurred must be provided prior to the cost share payment being authorized. These receipts are needed for federal reporting purposes.

### **Landowner Cost Shares for First Commercial Thinning of Pulpwood Stands**

To qualify for cost share for a first commercial thinning a stand must be:

1. 12 Years of Age or Older.
2. Privately owned forestland located in Mississippi.
3. Minimum of 10, and maximum of 5,000 contiguous acres
4. Be rated as moderate to very high hazard for southern pine Beetle Outbreak
5. comprised of at least 70% loblolly, shortleaf, or slash pine

### **Cost shares for landowners for 1<sup>st</sup> commercial thinnings are \$75 per acre .**

Receipts showing the total number of tons by product removed from the stand need to be provided prior to the cost share payment being authorized. The first and last scale tickets will also have to be provided. These receipts and scale tickets are needed for federal reporting purposes.

### **How to Apply for the SPB Cost Shares**

The procedures for applying for the cost share program are as follows:

1. The landowner will sign up for the program with an MSU Extension Forester. This representative will inspect the stand being enrolled prior to operations to ensure that it meets the qualifications listed above. **Once enrolled in the program, Landowners in Mississippi have 9 months to thin the stand. If the stand is not thinned during these time periods, the landowner will be dropped from the program.**

### **\*\*\*SEE MAP FOR LIST OF COUNTIES WITH ACTIVE SPB PREVENTION PROGRAMS \*\*\***

2. The cost share application forms will be signed by the landowner, and an MSU-Extension Forester.
3. **A description of the stand (with legal description, lat/long and maps) will be submitted to the MFC.**
4. Following thinning, an MSU-Extension Forester may visit the stand to verify that the thinning has been carried out according to the cost share guidelines and the management plan. In addition, documentation of

actual costs (precommercial thinning), or tons of pulpwood removed (first thinning of pulpwood stands) and the first and last scale tickets need to be provided. These are required for federal reporting purposes.

Thinnings are to be conducted according to the management plan either in place or developed. All Mississippi forestry best management practices (BMPs) are to be followed. The MFC will review the claim and, upon approval, will issue a cost share payment to the landowner.

**Restrictions:**

Participation in the SPB Cost Share program is subject to the following restrictions:

1. All requirements (as listed above) must be met.
2. Cost share thinning operations must reduce stand basal area to a maximum of 80 ft<sup>2</sup> of basal area per acre.
3. All Mississippi BMP guidelines are to be followed
4. Once the application has been approved, the landowner has **9 months** to get the enrolled stand thinned. If the thinning has not occurred within that time, the enrolled stand will be dropped from the program.
5. Total cost shares for Mississippi will not exceed **\$12,750 (170 acres)** per landowner or **\$15,000 (200 acres)** for a partnership or trust with two or more members, per federal fiscal year.
6. A minimum of 10 tons per acre must be harvested for first commercial thins.
7. Each approved tract is subject to inspection by state or federal crews before, during and after the thinning to ensure that all conditions of this program are being followed.
8. Landowner agrees to manage this thinned pine stand an additional 5 years after thinning. If the stand is clear cut before five years is completed then the landowner must contact the cost share administrator.

**For More Information**

If you have questions, or would like to apply for SPB prevention cost shares, contact:

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# 2015 Southern Pine Beetle Assistance Area

